

Additional Learning Goals

Elinor Wonders Why

In addition to the three broad areas covered in the original Elinor Wonders Why curriculum document (Science and Engineering practices, Life Sciences, and Natural Design), this document presents additional learning goals on:

- (1) Earth and Physical Sciences
- (2) Health and Wellness
- (3) Additional Natural Design Goals (Cross-cutting Concepts)

Each of these areas are comprised of many, much more specific subtopics. These subtopics will be addressed by individual episodes or learning experiences, and are described below. The specific curricular topics below are selected (with minor adaptations) directly from the *PBS Kids Ready To Learn Science Learning Framework* (Revision 6.7.18) in the PreK-K age range and from the *California Department of Education Health Education Content Standards for California Public Schools Kindergarten Level*.

Earth and Physical Sciences (EPS)

For the youngest children, learning about Earth is grounded in what children can experience with their senses, and their background knowledge and understanding of concepts of Life Science and Physical Science provide an important foundation for deeper understanding of the Earth. Their natural curiosity about and play with Earth materials in their own backyard leads them to look more closely at sand, rocks, water, and air and begin to describe the observable characteristics of each. They observe the weather in their local environment and think about how weather impacts their lives and the lives of other animals and plants. They also begin to think about how their decisions and actions, and those of other people, impact the environment.

Physical Science involves the direct exploration of objects, materials and events of the nonliving world that can be encountered in children's everyday lives. As they enter the preschool years, children are given more opportunities to play with and investigate liquids and solids, shadow and light, the pitch and volume of sounds, and how things move. In PreK and Kindergarten they look more closely at the difference between an object and the material it is made of, how pushes and pulls of different strengths and direction can affect the movement of objects, and how changes in temperature can cause a solid to become a liquid or a liquid to become a solid.

EPS1. Understand that the Earth is made up of a variety of natural materials

- a. Observe, play with, explore and describe various types of earth materials such as sand, rocks, soil, water, and air using the 5 senses and simple tools
- b. Begin to draw pictures to record the physical characteristics of basic earth materials
- c. Use simple scientific vocabulary to label earth materials (e.g., sand, rocks, soil, water, air)
- d. Explore water and other Earth materials during play using simple tools (e.g., funnels, tubes, measuring cups, containers of various sizes, balance scale)
- e. Sort and classify natural materials found in one's local environment

EPS2. Begin to understand that weather is the combination of sunlight, wind, snow, or rain and temperature in a particular region at a particular time and can be measured by people to describe and record the weather and to notice patterns over time.

- a. Use basic vocabulary to describe the current, daily weather conditions (e.g., sunny, cloudy, windy, raining, snowing, hot, cold)
- b. Describe how weather affects the decisions people make about clothing and activities (e.g., wear a coat, hat and mittens when it's cold and go swimming in the summer)
- c. Name and describe the 4 seasons and observable conditions for each season.
- d. Observe, describe, record and discuss patterns and changes in the weather and seasons (including through storytelling)
- e. Use simple tools (thermometer, rain gauge, weather chart) to collect and record data about elements of daily weather including sun, clouds, wind, snow, rain, and high or low temperatures.
- f. Use and share quantitative observations of local weather conditions to describe patterns over time (e.g., chart the number of sunny and cloudy days in a month).
- g. Notice and describe the impact of weather and seasonal changes on living things (e.g., identify weather-appropriate clothing and activity choices; recognize that many animals find shelter when it rains or hibernate when it's cold)
- h. Differentiate between typical (rain, sun, snow) and severe (hurricane, tornado) types of weather in the local community

EPS3. Understand that water is found in the ocean, rivers, lakes, and ponds and can exist as solid ice and in liquid form.

- a. Explore and describe different places where water is found in the local environment (e.g., puddles, rivers, lakes, ocean)

EPS4. Understand that plants and animals (including humans) can change their environment.

- a. Construct an argument (using evidence) for how plants and animals (including humans) can change the environment to meet their needs (e.g., squirrel digging holes in the ground to hide nuts)

EPS5. Understand that things people do to live comfortably can affect the world around them, but they can make choices that reduce their impacts on the land, water, air, and other living things

- a. Ask questions about and discuss examples of how humans use Earth's resources (including soil and water) to meet their needs (e.g., water can be used for drinking, washing, watering plants, putting out fires, boating, and fishing) and how the Earth's resources might be conserved by humans for use by other animals and plants.
- b. Demonstrate an awareness of and the ability to discuss in simple terms the need for conservation, recycling, and respect for the environment, as well as an awareness of

- Earth's finite resources (e.g., turning off lights and faucets, reusing materials for another activity, separating materials into recycling bins)
- c. Participate in simple activities to care for the environment (e.g., pick up and throw away litter, recycle plastic bottles and containers)
 - d. Identify practices that are good for the environment, such as turning off lights and water, recycling, and picking up trash.

EPS5. Begin to understand that different kinds of matter exist and these can be described and classified by their observable properties.

- a. Use the 5 senses to observe, play with, manipulate, and describe a variety of human-made and natural materials (solid and nonsolid) including water, sand, clay, paint, glue, blocks, simple household items, and objects made from wood, metal, or cloth.
- b. Demonstrate an increased ability to observe, manipulate, describe and ask questions about the characteristics and physical properties of familiar human-made and natural objects and liquids.
- c. Use tools to investigate familiar natural and human-made objects to describe, compare, sort and classify them based on observable characteristics.

EPS6. Begin to understand that different kinds of matter can be solid or liquid depending on temperature.

- a. Investigate, with support, the physical properties of solids and liquids (size, weight, shape, color, texture, and sound)
- b. Identify and investigate the differences between solids and liquids
- c. Recognize that matter takes on different shapes depending upon its state (e.g., solids have a definite shape, liquids take the shape of their container)
- d. Engage in an experience to investigate the idea that different kinds of materials can change and be a solid or liquid depending on temperature (PreK with support)

EPS7. Begin to understand basic physical and chemical changes.

- a. Observe and explore simple physical changes that can be observed firsthand (e.g., ice cube or snow melting, puddles disappearing).
- b. Combine materials to make a new substance. (e.g., mix water and soil to make mud)
- c. Observe and discuss changes in solid materials (e.g., ice cream melting, cookie crumbling)
- d. Observe and describe changes in food when participating in adult-led cooking activities
- e. Begin to understand that changing shape or breaking apart objects does not change the "amount" of material it is made up of
- f. Begin to understand that heating, cooling or mixing a substance may cause changes that can be observed and that sometimes these changes are reversible (freezing and melting water) and sometimes they are not (cooking an egg)
- g. Investigate physical objects and materials to understand that they can change under different circumstances (e.g., building up or breaking apart, mixing, dissolving, or changing state like when ice melts to liquid in warm temperatures)

EPS8. Understand that different properties of materials are suited to different purposes.

- a. Distinguish between an object and the material(s) from which it is made
- b. Explore familiar objects to determine and describe how the materials of which they are made are related to the objects' properties (e.g., a wooden block is hard, solid, and has smooth sides while a foam ball is soft, squishy, light, and has a rougher texture)
- c. Determine whether an object is human-made or occurs in nature based on observable properties

- d. Identify the uses of various natural or human-made objects based on their properties

EPS9. Begin to understand that pushes and pulls can cause objects to move

- a. Recognize that objects can be moved and participate in activities involving moving objects
- b. Observe and describe the motion of objects using basic vocabulary in terms of speed (fast/slow), direction (up/down/left/right), the way things move (rolling/sliding)
- c. Explore and communicate the effect of one's own actions on how objects move (e.g., pushing, pulling, rolling, dropping)
- d. Observe and describe factors involved when things stand or fall (e.g., building a block tower that can stand up)
- e. Explore and describe the effects of simple forces that push or pull in nature, such as wind and gravity
- f. Observe and discuss ideas, based in evidence, about what makes something move and how movements can be controlled and changed (PreK with support)
- g. Make and record observations about the motion of objects to explore the effects of pushes and pulls
- h. Plan and conduct an investigation to compare different types of pushes and pulls (e.g., a string pulling an object, person pushing an object, person stopping a rolling ball, objects colliding)

EPS10. Understand that pushes and pulls can have different strengths and directions

- a. Compare the effects of different strengths or different directions of pushes and pulls

EPS11. Understand that pushing on an object can change the speed or direction of its motion and can start or stop it

- a. Observe and communicate the effect of one's own actions on the motion of objects including changes in speed and direction
- b. Engineering Connection: Analyze data to decide if a design solution works (as intended) to change the speed or direction of an object

EPS12. Understand that when objects touch or collide, they push on one another and can change motion

- a. Observe and communicate the cause and effect when objects touch and collide

EPS13. Understand that sunlight warms Earth's surface

- b. Make and record observations of the warming effect of sunlight on materials found on Earth's surface including sand, rocks, soil and water
- c. Engineering Connection: Use tools and materials to design and build a model of a structure that will reduce the warming effect of sunlight on an area (e.g. umbrellas, canopies, and tents) (K only)

EPS14. Understand that a bigger push or pull makes things go faster or slow down more quickly (relationship between energy and forces)

- a. Plan and conduct an investigation to compare the effects of different strengths of pushes and pulls on the motion of an object (K only) Observe and communicate the cause and effect when objects touch and collide

EPS15. Begin to explore that vibrating matter can make sound, and that sound can make matter vibrate

- a. Play with different objects and materials to make different types of sounds through banging, rubbing, plucking, etc. (e.g., musical instruments, pots and pans, plastic containers, kitchen utensils, blocks, sticks, rubber bands, string, beans in a container)
- b. Investigate sounds made by different objects and materials
- c. Discuss possible explanations for what causes sounds made by different objects and materials
- d. Through play and investigations, identify ways to manipulate and change different objects and materials to change the volume (loud/soft) and pitch (high/low)

EPS16. Begin to explore light and the idea that some materials block all the light creating a dark shadow on any surface beyond them, where the light cannot reach

- a. Observe one's own shadows and shadows of other things (both indoors and outdoors), noticing that shadows are observable when there is a light (sun or moon is shining, flashlight) but not observable on a cloudy or dark day or indoors when the lights are out
- b. Observe and investigate relationships between the size and shape of shadows by exploring a light source and a variety of objects to create the shadows

Health and Wellness (HW)

Since there is currently no PBS Kids official learning framework, the following is adapted from the *California Department of Education Health Education Content Standards for California Public Schools Kindergarten Level*.

The health education standards are organized into these selected health content areas:

- Nutrition and Physical Activity
- Growth, Development
- Personal and Community Health

HW1. Nutrition

- a. Name a variety of healthy foods and explain why they are necessary for good health.
- b. Identify a variety of healthy snacks.
- c. Recognize the importance of a healthy breakfast.
- d. Explain how to ask family members for healthy food options.
- e. Recognize that not all products advertised or sold are good for them.
- f. Choose healthy foods in a variety of settings.
- g. Discuss portion size & learn about food groups.

HW2. Growth and Development

- a. Describe their own physical characteristics.
- b. Identify trusted adults who promote healthy growth and development (e.g., physicians, nurses, dentists, and optometrists).
- c. Name and describe the five senses.

- d. Model engaging in regular movement and social activities.

HW3. Personal and Community Health and Safety

- a. Describe sun-safety practices.
- b. Identify ways to be safe while at play.
- c. Recognize that we follow rules to stay safe.
- d. Define “germs.”
- e. Explain why the transmission of germs may be harmful to health.
- f. Understand the importance of hygiene.
- g. Demonstrate behaviors to prevent illness including washing hands, sneezing or coughing in your elbow, using and throwing away tissues, drinking water, wearing appropriate clothing for the weather.
- h. Know to ask before taking action that might be unsafe (e.g. pick up dangerous items from the ground, like glass pieces, using a knife or scissors to cut something).

In addition, we are updating a few of the Life Sciences (LS) Learning Goals from the original Curriculum to include Health and Wellness:

Updated LS2. Understand that animals (**including humans**) have different body parts that are used in different ways to meet their needs, and that plants have different parts that help them survive and grow:

- a. Identify body parts of animals, **including humans**, and their function
- b. Identify the basic parts of plants and their function
- c. Compare how the external body parts of animals and plants are the same and/or different
- d. Explore how different external features of an animal help it survive in its environment

Updated LS4. Understand that all animals (**including humans**) and plants have a life cycle, can reproduce, and change and grow over time:

- a. Observe the life cycle of familiar plants and animals, **including humans**
- b. Observe the growth in animals (**including humans**) and plants
- c. Understand that living things grow and change over time
- d. Explore parts of different kinds of life cycles of plants and animals

Additional Information about Health and Wellness

Following is an excerpt from the California Preschool Instructional Network (CPIN, funded by the California Department of Social Services, Child Care and Development Division) and their California Preschool Curriculum Framework, Volume 2, [Health Chapter](#).

Children are naturally curious about their body parts, especially **external body parts** that are visible. Often, preschool health education begins with a unit on the five senses—sight, smell, hearing, taste, and touch—and the body parts associated with each sense. The five senses are incorporated in all learning activities during preschool. For example, if a food *looks* good and *smells* good, most children will want to *taste* it. The senses are integrated into all domains, such as math (e.g.,

“How many apples do you see? Which apple is bigger?”); science (e.g., “How does fresh bread smell?” “How does the color change after the bread is toasted?” “How does it feel on your tongue after the bread is toasted?”); and language (e.g., “Let’s read a story about visiting the dentist.”)

The five senses provide an introduction to how body parts work. Children can recognize the external body parts (e.g., eyes, ears, nose, tongue, fingers) and, through hands-on activities, can associate those parts with specific functions.

Children can also explore how these body parts work together. For example, a food activity or snack with crispy rice cereal and milk allows children to see the food, touch it to compare dry cereal with wet milk, hear the cereal crackle when the milk is added, and smell and taste the cereal both with and without milk.

The concept of **internal body parts** is more difficult for preschoolers to understand. Teachers may begin with the mouth and tongue. Children looking in a mirror can see their faces and lips; when they open their mouth, they see the tongue and teeth. Children with visual impairments can be encouraged to feel the tongue and teeth. This introduces the concept that there are body parts that are not easily seen. Teachers can reinforce the concept of both internal and visible body parts by inviting children to welcome themselves to school by way of greeting their body parts during circle time (e.g., “Good morning, heart,” “Hello, fingers”).

Preschool teachers can introduce specific body parts, one at a time, based on children’s previous learning and experiences. Most children have experienced a cut or scratch, so they can understand that there is blood inside their body. Older preschoolers can be introduced to the idea that there is a heart inside their body.

Appropriate hands-on activities (e.g., feeling their heart beat after a movement activity, listening through a stethoscope) help children understand that their heart pumps blood.

Preschoolers can begin to understand that bones provide a frame for the body and help them move. A variety of activities may be used to introduce children to bones, such as feeling bones in their own bodies (e.g., kneecap), looking at and touching the bones after eating chicken, and showing and explaining how X-rays are pictures of the inside of the body.

Older preschoolers may begin to learn that they have muscles under their skin and that muscles also help them move. They can see the difference in muscles by comparing their own bodies to the bodies of older siblings or adults. Keep concepts simple; it is enough for children to learn that they have internal body parts, such as

bones and muscles, and that these body parts have specific functions. As children learn about their own bodies, they will build on this information to understand and learn about other concepts presented in the primary grades.

Encourage children to tell an adult when they are hurting. If a child expresses, “I don’t feel good,” it is helpful to know if it is his or her head, stomach, or extremities (e.g., arms, legs) that hurt. Learning about body parts will enable children to communicate specific information about what hurts. Children may communicate by verbalizing (e.g., “My stomach/tummy hurts”) or by pointing to the affected area of their bodies (e.g., “My knee is bleeding”).

A goal of preschool health education is to help children become familiar with health helpers and learn to communicate their feelings and questions.

Additional Natural Design Learning Goals

In addition to the Natural Design (ND) Learning Goals in the original Curriculum Document, we are adding goals that focus on Cross-Cutting Concepts that bridge Earth and Physical Science, Health and Wellness and Engineering Design (similar to how previous ND goals bridged the Life Sciences with Design).

ND6. (RTL Crosscutting concept ‘Physical Patterns’): Understand that physical phenomena often follow patterns, and those patterns can inform the design of objects in our world. (e.g. Smaller musical instruments can produce higher-pitched sounds while larger instruments can produce lower-pitched sounds; how the seasons or day/night cycles affect designs; how waves in the ocean impact designs)

ND7. (RTL Crosscutting concept ‘Physical Systems’): Begin to understand that physical phenomena can be composed of systems of parts or effects, and those systems can inform how objects are designed. (e.g. A swing set is a system made of different parts that work together; Shadows are created when a light source is blocked; How the water cycle impacts how we live).

ND8. (RTL Crosscutting concept ‘Physical Structure and Function’): Understand that different structures and materials that can be found in the physical world can impact the design of objects in our world. (e.g. Solid, non-porous materials like metal or plastic are good materials for use as plates and bowls; Round objects like balls move by rolling; Rocks make good stone walls because they stack and do not blow over easily).

ND9. (RTL Crosscutting concept ‘Physical Stability and Change’): Appreciate that matter can change in state due to different conditions, and that these changes can impact the design of objects in our world. (e.g. Melting snow slightly can make it better for building snow structures; A sand castle washes away when a wave comes but a stone wall can last a long time; how tidal change affect designs along the coast).

ND10. (RTL Crosscutting concept ‘Physical Cause and Effect’): Appreciate that physical phenomena can affect and be affected by actions, which informs the design of objects in our world. (e.g. Applying force causes objects to move; Plucking a string on a guitar to make it vibrate produces a sound; A dropped object falls to the ground; The larger ball rolls farther off the ramp; Rainstorms wash away soil; Wind moves things).

ND11. (RTL Crosscutting concept ‘Physical Scale, Proportion and Quantity’): Appreciate that objects and physical phenomena can vary by different measures, and that those differences can affect how we design things in our world. (e.g. Heaviest and lightest objects have different requirements; Pitch of a sound is related to the size of the instrument; Using numbers to describe the number of objects can help you design things appropriately).

ND12. (‘Health and Wellness Connections’): Appreciate that factors that affect our health and wellness can impact how we design things in our world. (e.g. Why helmets are designed the way they are; how your portion size can affect your plate or container size)